REMARKS/ARGUMENTS

Reconsideration of the above-identified application in view of the present amendment is respectfully requested. Claims 1-8, 12-21, and 24-34 are pending. Claims 27-34 are added. Claims 13 and 14 are amended to provide proper antecedent basis to the weld pool. Claim 18 is amended to provide proper antecedent basis to the path. The amendments to claims 13, 14, and 18 were not done to further distinguish from the prior art.

Claims 1-5, 7, 13-16, 18, 20, and 26 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Jones in view of Shepard, Dostoomian, and Chang. This rejection is respectfully traversed.

The M.P.E.P. sets forth the criteria for a rejection for obviousness under 35 U.S.C. §103 as follows:

> To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure.

See, M.P.E.P. § 706.02(j) *citing* In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

There is no evidence in the record or references themselves to suggest modifying Jones to include the teachings of Shepard. The examiner merely says that it would be obvious to do so as to provide the operator with a visual thermal data which could allow the operator to immediately see defects and lack of integrity of the

weld, in order to take necessary actions. However, this is speculative. It is respectfully suggested that the combination of Jones and Shepard only seems plausible after having the benefit of the Applicants' disclosure. The use of the teachings of the present invention to find obviousness is impermissible.

> The court must be ever alert not to read obviousness into an invention on the basis of applicant's own statements; that is, we must view the prior art without reading into that art applicant's teachings. The issue, then, is whether the teachings of the prior art would, in and of themselves and without the benefits of appellant's disclosure, make the invention as a whole obvious.

In Re Sponnoble, 160 USPQ 237 at 243 (CCPA 1969) (emphasis in original).

Accordingly, the Examiner must consider only the teachings of the prior art references. Without the teachings of the present invention, one of ordinary skill in the art would not even consider combining the teachings of Jones and Shepard to attempt to arrive at the presently claimed invention.

Further, there would not be a reasonable expectation of success to combine the teachings of Jones and Shepard. The use of the camera 108 and computer 112 of Shepard could not obtain the thermal image of the weld of Jones, because the camera 108 and computer 112 of Shepard are configured to obtain a time-temperature history of already formed metal weld nuggets. The camera 108 and computer 112 of Shepard are not configured to obtain the thermal image of the weld between the plastic pieces disclosed in Jones. In particular, to obtain the time-temperature history of the metal weld nugget, the computer 112 of Shephard measures the time-temperature characteristic, such as the half-max time, for each pixel in the image, the computer may generate a map of the pixel half-max times as a new image (See Col. 4, lines 12-14). Shepard prefers the use of the half-max time

for measuring the time-temperature characteristic and discloses that the half-max time for a weld may be determined empirically or may also be estimated from a known formula for flash thermal diffusivity measurement, so that $t_{1/2\,max} = 1.38L^2/\pi^2\alpha$, where α and L are the thermal diffusivity and the thickness of the sheet metal, respectively (See Col. 3, lines 37-65). Thus, the teachings of these references are not sufficient to render claims 1-5, 7, 13-16, 18, 20, and 26 prima facie obvious.

Also, if the proposed combination "would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious." In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) (MPEP §2143.01).

Such a proposed modification of Jones with Shepard would change the principle of operation of Jones. In particular, the IR camera 108 would have to be between the laser 5 of Jones and the joint region 3 of plastic workpieces so that the camera's field of view is unblocked in order to properly capture the sample as an image. However, in this position, the camera would also block the beam of non-visible radiation 4 from welding the joint. Even the possibility of modifying Jones to use the mirror 202 of Shepard would not be able to solve this problem, because the mirror 202 of Shepard reflects visible light from the heat source to heat the metal weld nugget but passes infrared light (See Col.3, lines 7-10 and Col. 7, lines 54-60). Jones requires the use of a beam of non-visible radiation 4 to weld the joint region 3 (See paragraphs [0028], [0032], and [0035]). The beam of non-visible radiation 4 of Jones light would pass through the mirror 202 of Shepard rather than being reflected. Thus, the mirror 202 of Shepard could not be used to reflect the beam of non-visible radiation 4 to weld the joint region 3.

Therefore, the proposed combination of Jones with Shepard would change the principle of operation of Jones, and thus for this reason alone the teachings of these references are not sufficient to render claims 1-5, 7, 13-16, 18, 20, and 26 prima facie obvious.

In fact, one of ordinary skilled in the art would be lead away from combining Jones and Shepard because Shepard obtains and collects the thermal data by reheating the weld. To reheat the weld between the plastic pieces of Jones might damage the integrity of the weld due to the plastic material having a lower melting point than that of metal.

Furthermore, it would not be obvious to modify the device of Jones, so as to simultaneously heat and obtain an image as allegedly taught by Chang. Chang fails to disclose that the heating step forms the pool of material which forms a weld, at the location of abutment. Chang only discloses a device that heats the joint in order to inspect the joint. Thus, even Chang and Jones combined does not teach or suggest the limitation that the thermal image is obtained simultaneous with the heating step, which heating step forms the pool of material at the location of abutment which pool of material forms a weld. There is also no evidence in the record or references themselves to suggest modifying Jones in view of Chang. The examiner merely states that to do so would allow the operator to, in real time, analyze the image and take immediate actions simultaneously with heating the weld and thus, avoid enhancing the defect in the weld by a possible overheating. However, this not even inferred in the art because neither Jones nor Chang teach that the heating step which forms the weld is done simultaneously with obtaining the thermal image.

Thus, the teachings of Jones and Chang references are not sufficient to render claims 1-5, 7, 13-16, 18, 20, and 26 prima facie obvious.

Also, with respect to claims 1-5, 7, 17, 19, 20, and 26, there is no evidence in the record or references themselves to suggest modifying Jones to include the control device with feedback of Dostoomian. The examiner merely says that it would be obvious to do so to allow the operator to control defects, lack of integrity of the weld caused by improper process/improper heating by controlling the weld temperature within the predetermined (desired/standard) limits. However, this reason is speculative. It is respectfully suggested that the combination of Jones et al. and Dostoomian only seems plausible after having the benefit of the Applicants' disclosure.

Further, there would not be a reasonable expectation of success for combining the teachings of Jones and Dostoomian. The controller of Dostoomian is not designed to accept a feedback signal that is provided in response to determining that a characteristic from analyzing the obtained thermal image, fails to meet an associated criterion. The controller of Dostoomian includes a windowed welding tip 192 connected to a fiber optic cable or bundle. The fiber optic cable has another end located in the vicinity of an illumination portion of an infrared sensor. The thermal–radiation intensity-level output of the infrared sensor is compared with a thermal history signal to adjust the welding current. No feedback signal is provided to the controller of Dostoomian in response to determining that a characteristic from analyzing the obtained thermal image, fails to meet an associated criterion. Only the thermal-radiation intensity-level output of the infrared sensor is provided.

In fact, the device and method of Dostoomian appears not to be in the field of applicant's endeavor. Dostoomian is related to spot welding whereas the field of applicant's endeavor is laser welding. See, for example, Wang Laboratories, Inc. v. Toshiba Corp., 993 F.2d 858, 26 USPQ2d 1767 (Fed. Cir. 1993) (Patent claims were directed to single in-line memory modules (SIMMs) for installation on a printed circuit motherboard for use in personal computers. Reference to a SIMM for an industrial controller was not necessarily in the same field of endeavor as the claimed subject matter merely because it related to memories. Reference was found to be in a different field of endeavor because it involved memory circuits in which modules of varying sizes may be added or replaced, whereas the claimed invention involved compact modular memories. Furthermore, since memory modules of the claims at issue were intended for personal computers and used dynamic random-access-memories, whereas reference SIMM was developed for use in large industrial machine controllers and only taught the use of static random- access-memories or read-only-memories, the finding that the reference was nonanalogous was supported by substantial evidence). Thus, for these reasons alone, the teachings of the Jones and Dostoomian references are not sufficient to render claims 1-5, 7, 17, 19, 20 and 26 prima facie obvious.

Further, to modify Jones et al. to include the controller having the windowed welding tip of Dostoomian might change the principle of operation of Jones, because the welding tip would block the beam of nonvisible radiation 4 from the laser 5 of Jones et al. Even if the laser 5 could be modified to include the windowed welding tip of Dostoomian, such a modification would involve extensive redesigning. Thus,

for these reasons alone, the teachings of the Jones and Dostoomian references are not sufficient to render claims 1-5, 7, 17, 19, 20 and 26 prima facie obvious.

Additionally, with respect to claims 13-16, 18, and 20, even Jones, Shepard, Dostoomian, and Chang combined do not suggest all of the limitations of these claims. Specifically, neither Jones, Shepard, Dostoomian, and Chang taken either alone or in combination disclose heating the first and second plastic pieces at their location of abutment by directing the laser beam over the path of the weld pool multiple times. Therefore, for this reason alone, the rejection of claims 13-16, 18, and 20 fails to fulfill the criteria for obviousness under 35 U.S.C. §103 and should be withdrawn.

Therefore, in view of the above-mentioned reasons, the rejection to claims 1-5, 7, 13-16, 18, 20, and 26 as being unpatentable over Jones in view of Shepard, Dostoomian, and Chang is improper and should be withdrawn.

Claims 1-5, 7, 13-16, 18, 20, and 26 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Shepard in view of Jones, Dostoomian, Chang, and Emmelmann. This rejection is respectfully traversed.

There is no evidence in the record or references themselves to suggest modifying Shepard to include the teachings of Jones. The examiner merely says that it would be obvious to do so because the plastic material also needs to be evaluated for the weld quality, since a defective weld can cause a dramatic consequence, such as for example, breaking of plastic shower pipes which can cause burning to a person. However, this is speculative. It is respectfully suggested that the combination of Jones and Shepard only seems plausible after having the benefit of the Applicants' disclosure, which is impermissible.

Further, such a proposed modification of Shepard with Jones would change the principle of operation of Shepard. The use of the camera 108 and computer 112 of Shepard could not obtain the thermal image of the weld of Jones et al., because the camera 108 and computer 112 of Shepard are configured to obtain a time-temperature history of already formed metal weld nuggets. The camera 108 and computer 112 of Shepard are not configured to obtain the thermal image of the weld between the plastic pieces disclosed in Jones et al. In particular, to obtain the time-temperature history of the metal weld nugget, the computer 112 of Shepard measures the time-temperature characteristic, such as the half-max time, for each pixel in the image, the computer may generate a map of the pixel half-max times as a new image (See Col. 4, lines 12-14). Shepard prefers the use of the half-max time for measuring the time-temperature characteristic and discloses that the half-max time for a weld may be determined empirically or may also be estimated from a known formula for flash thermal diffusivity measurement, so that $t_{1/2\,max} = 1.38L^2/\pi^2\alpha$, where α and L are the thermal diffusivity and the thickness of the sheet metal, respectively (See Col. 3, lines 37-65). Thus, the camera 108 and computer 112 of Shepard would not be able to obtain a thermal image of the weld between the plastic pieces disclosed in Jones.

Moreover, the heat source 102 of Shepard is not used to form a pool of material to form the weld. The heat source simply heats the already formed weld for testing weld integrity. Even if the laser 5 of Jones is used, the IR camera 108 would have to be between the laser 5 of Jones and the joint region 3 of plastic workpieces so that the camera's field of view is unblocked in order to properly capture the sample as an image. However, in this position, the camera would also block the

beam of non-visible radiation 4 from welding the joint. Even the possibility of using the mirror 202 of Shepard would not be able to solve this problem, because the mirror 202 of Shepard reflects visible light from the heat source to heat the metal weld nugget, but passes infrared light (See Col.3, lines 7-10 and Col. 7, lines 54-60). Yet, Jones et al. requires the use a beam of non-visible radiation 4 to weld the joint region 3 (See paragraphs [0028], [0032], and [0035]). The beam of non-visible radiation 4 of Jones light would pass through the mirror 202 of Shepard rather than being reflected. Thus, the mirror 202 of Shepard could not be used to reflect the beam of non-visible radiation 4 to weld the joint region 3. Therefore, the principle operation of Shepard would change, if Shepard is modified in view of Jones. Thus, the teachings of these references are not sufficient to render claims 1-5, 7, 13-16, 18, 20, and 26 prima facie obvious.

In fact, one of ordinary skilled in the art would be lead away from combining Jones and Shepard because Shepard obtains and collects the thermal data by reheating the weld. To reheat the weld between the plastic pieces of Jones might damage the integrity of the weld due to the plastic material having a lower melting point than that of metal.

Furthermore, it would not be obvious to modify the device of Shepard, so as to simultaneously heat and obtain an image as allegedly taught by Chang. Chang fails to disclose that the heating step forms the pool of material at the location of abutment which pool of material forms a weld. Chang only discloses a device that heats the joint in order to inspect the joint. Thus, even Chang and Shepard combined do not teach or suggest the limitation that the thermal image is obtained simultaneously with the heating step, which heating step forms the pool of material

which forms a weld, at the location of abutment. There is also no evidence in the record or references themselves to suggest modifying Shepard in view of Chang. The examiner merely states that to do so would allow the operator to, in real time, analyze the image and take immediate actions simultaneously with heating the weld and thus, avoid enhancing the defect in the weld by a possible overheating. However, this is not even inferred in the art because neither Shepard nor Chang teach that the heating step which forms the weld is done simultaneously with obtaining the thermal image. Thus, the teachings of Shepard and Chang references are not sufficient to render claims 1-5, 7, 13-16, 18, 20, and 26 prima facie obvious.

Also with respect to claims 1-5, 7, 17, 19, 20, and 26, there is no evidence in the record or references themselves to suggest modifying Shepard to include the control device with feedback of Dostoomian. The examiner merely says that it would be obvious to do so to allow the operator to control defects, lack of integrity of the weld caused by improper process/improper heating by controlling the weld temperature within predetermined (desired/standard) limits. However, this reason is speculative. It is respectfully suggested that the combination of Shepard and Dostoomian only seems plausible after having the benefit of the Applicants' disclosure.

Further, the controller of Dostoomian is <u>not</u> designed to accept a feedback signal that is provided in response to determining that a characteristic from analyzing the obtained thermal image, fails to meet an associated criterion. The controller of Dostoomian is also not designed to accept any signals from the camera 108 of Shepard. The controller of Dostoomian includes a windowed welding tip 192 connected to a fiber optic cable or bundle. The fiber optic cable has another end

located in the vicinity of an illumination portion of an infrared sensor. The thermal–radiation intensity-level output of the infrared sensor is compared with a thermal history signal to adjust the welding current. No feedback signal is provided to the controller of Dostoomian in response to determining that a characteristic from analyzing the obtained thermal image, fails to meet an associated criterion. Only the thermal-radiation intensity-level output of the infrared sensor is provided. As discussed above, the device and method of Dostoomian appears not to be in the field of applicant's endeavor. Dostoomian is related to spot welding whereas the field of applicant's endeavor is laser welding. Thus, for these reasons alone, the teachings of the Shepard and Dostoomian references are not sufficient to render claims 1-5, 7, 17, 19, 20 and 26 prima facie obvious.

Further, to modify Shepard to include the controller having the windowed welding tip of Dostoomian might change the principle of operation of Shepard, because the welding tip would block a laser beam. Even if a laser could be modified to include the windowed welding tip of Dostoomian, such a modification would involve extensive redesigning. Thus, for these reasons alone, the teachings of the Shepard and Dostoomian references are not sufficient to render claims 1-5, 7, 17, 19, 20 and 26 prima facie obvious.

Thus, in view of the above-mentioned reasons, the rejection to claims 1-5, 7, 13-16, 18, 20, and 26 as being unpatentable over Shepard in view of Jones, Dostoomian, Chang, and Emmelmann is improper and should be withdrawn.

Therefore, for the above-mentioned reasons, claims 1 and 13 should be allowed. Claims 2-8, 25, and 26 depend from claim 1 and are therefore allowable as depending from an allowable claim and for the specific features recited therein.

Claims 14-21 and 24 depend from claim 13 and are therefore allowable as depending from an allowable claim and for the specific features recited therein.

New claim 27, which depends on claim 25, should be allowed for the same reasons as claim 25 and also for the additional feature that the modifying is performed by moving the laser beam over the path at different speeds. None of the prior art references disclose or suggest this feature and including all of the limitations of claim 25. Therefore, claim 27 is allowable.

New claim 28, which depends on claim 1, should be allowed for the same reasons as claim 1 and also for the additional feature that the step of obtaining the thermal image as the weld is being formed does not include collecting the wavelength of the laser beam used to heat the first and second pieces of plastic material at their location of abutment. None of the prior art references disclose or suggest this feature and including all of the limitations of claim 1. Therefore, claim 28 is allowable.

New claim 29, which depends from claim 1, should be allowed for the same reasons as claim 1 and also for the additional feature that the laser beam is reflected by a reflective device onto the first and second pieces at their location of abutment. None of the prior art references disclose or suggest this feature and including all of the limitations of claim 1. Therefore, claim 29 is allowable.

New claim 30, which depends on claim 29, should be allowed for the same reasons as claim 29 and also for the additional feature of the step of positioning an infrared camera having a field of view to obtain the thermal image, wherein the reflective device is outside the field of view of the infrared camera. None of the prior

art references disclose or suggest this feature and including all of the limitations of claim 29. Therefore, claim 30 is allowable.

New claim 31, which depends on claim 1, should be allowed for the same reasons as claim 1 and also for the step of, simultaneous with said heating step, obtaining another thermal image as the weld is being formed by collecting infrared radiation passing through the second piece of material from the weld and the pool of material and each of the thermal image and the other thermal image including, in its entirety, a weld pool that results in the weld. None of the prior art references disclose or suggest this feature and including all of the limitations of claim 1. Therefore, claim 31 is allowable.

New claim 32, which depends from claim 31, should be allowed for the same reasons as claim 31 and also for the additional steps of analyzing the obtained other thermal image for characteristics indicative of an acceptable weld being formed; providing another feedback signal to a weld controller in response to determining that a characteristic from analyzing the other thermal image fails to meet an associated criterion; and modifying the heating in response to the other feedback signal. None of the prior art references disclose or suggest these features and including all of the limitations of claim 31. Therefore, claim 32 is allowable.

In view of the foregoing, it is respectfully requested that the amendment be entered and the application allowed.

Please charge any deficiency or credit any overpayment in the fees for this amendment to our Deposit Account No. 20-0090.

Respectfully submitted,

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